

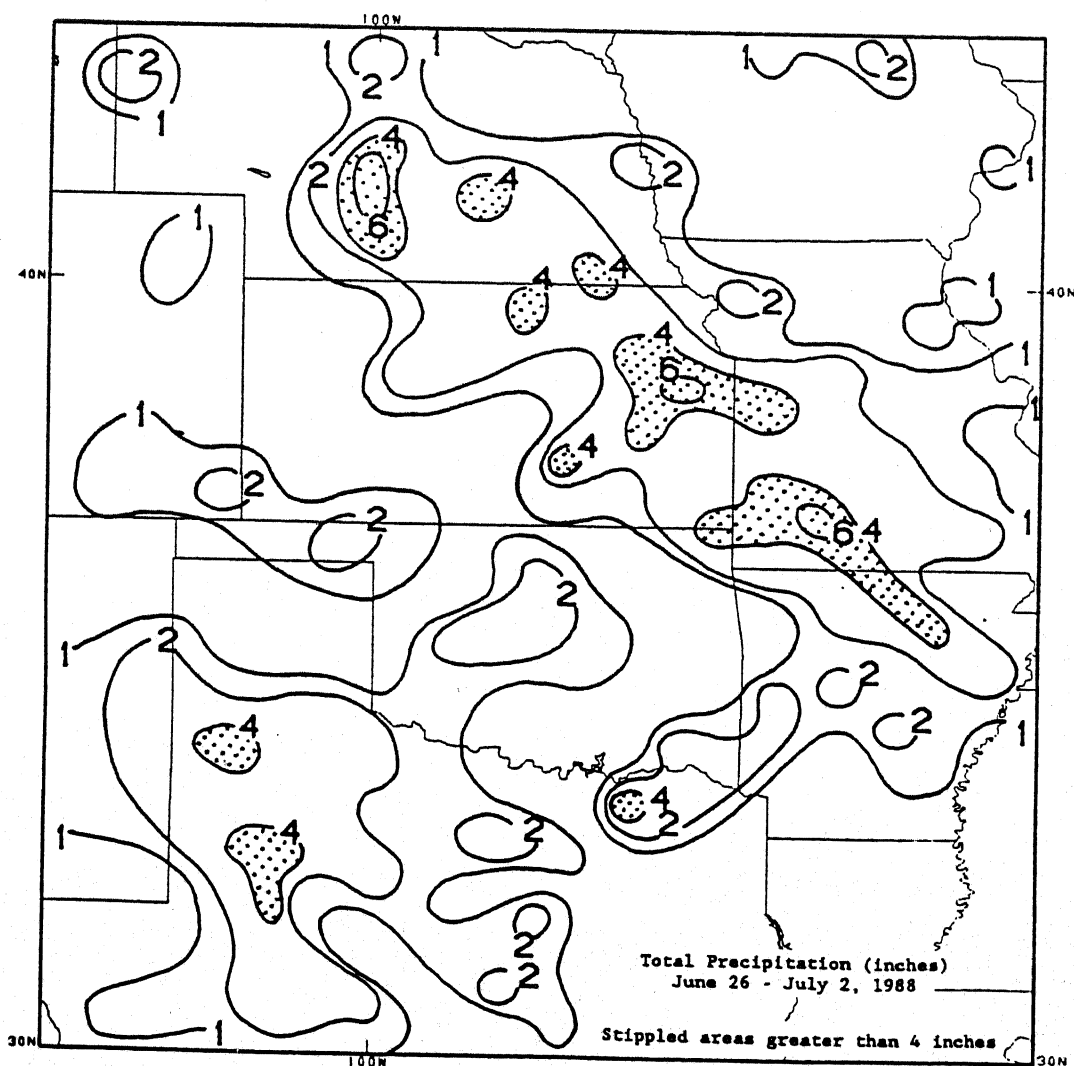


# WEEKLY CLIMATE BULLETIN

No. 88/27

Washington, DC

July 2, 1988



TORRENTIAL THUNDERSTORMS DROPPED UP TO 13.0 INCHES OF RAIN ON EAST-CENTRAL KANSAS LAST WEEK AS THE HEAVY PRECIPITATION BROUGHT TEMPORARY RELIEF TO THE DRYNESS IN PARTS OF THE GREAT PLAINS AND SOUTH, HOWEVER, MOST AREAS TO THE EAST FAILED TO RECEIVE ANY SIGNIFICANT RAINFALL AS RECORD DRYNESS PERSISTED IN THE NORTH. GRIP MTI



# GLOBAL CLIMATE HIGHLIGHTS

## MAJOR CLIMATE EVENTS AND ANOMALIES AS OF JULY 18, 1992

### 1. United States:

#### SEVERE WEATHER RAVAGES COUNTRY.

Widespread heavy showers and thunderstorms drenched most of the central and eastern states with 100 to 250 mm of rain. Flooding was reported in parts of Indiana, Ohio, and Pennsylvania. In south-central Iowa, almost 250 mm of rain in two hours caused flooding while 50 mm in 90 minutes created a mudslide near Salt Lake City, UT. In addition, numerous tornadoes and high winds caused considerable damage in the Midwest and the Northeast [Episodic Events].

### 2. Central South America:

#### COLD CONDITIONS DEVELOP.

Cold Antarctic air swept into the region, allowing temperatures to average as much as 3°C to 8°C below normal in much of Bolivia, Paraguay, and west-central Brazil, with the largest departures reported in eastern and southern Bolivia [3 weeks].

### 3. Northern Europe:

#### RAINS BRING LIMITED RELIEF.

As much as 100 mm of rain in southern Sweden brought relief from the dry spell while most locations in Germany, Poland, western Russia, and the Baltic States received 10 to 40 mm. Six-week moisture deficits remained near 75 mm in Denmark, northern Germany, and western Poland. In addition, over a thousand hectares of forest in Latvia and Russia were charred by wildfires, according to press reports.

### 4. Southern Europe:

#### DRIER WEATHER REPORTED.

Most areas received less than 10 mm of rain, allowing the wet spell to ease slightly, but amounts totaled 50 to 100 mm in the Alps, central Yugoslavia, and southwestern portions of the Commonwealth of Independent States. Rainfall surpluses since early June approached 150 mm in France and Italy [17 weeks].

### 5. Greece and Turkey:

#### A CHILLY SUMMER CONTINUES.

Cool conditions continued across Greece and Turkey as weekly temperatures averaged 4°C to 5°C below normal [17 weeks].

### 6. Western Sahel:

#### RAINFALL INCREASES SOMEWHAT.

The best week of seasonal rains to date yielded 40 to 100 mm at many locations, but six-week moisture deficits remained near 115 mm in Mali and as high as 500 mm in Cote D'Ivoire [7 weeks].

### 7. Northern India and Southern Pakistan:

#### MONSOON STILL WEAK.

Light to moderate rains finally reached Nepal and central India with totals of 20 to 70 mm while amounts approached 400 mm along the southwestern coast of India. Precipitation shortfalls since early June ranged from 100 mm in southern Pakistan to 700 mm in parts of India, although the week's rains nearly doubled the total monsoonal rainfall since May 1 in some sections of central India [12 weeks].

### 8. Eastern Asia:

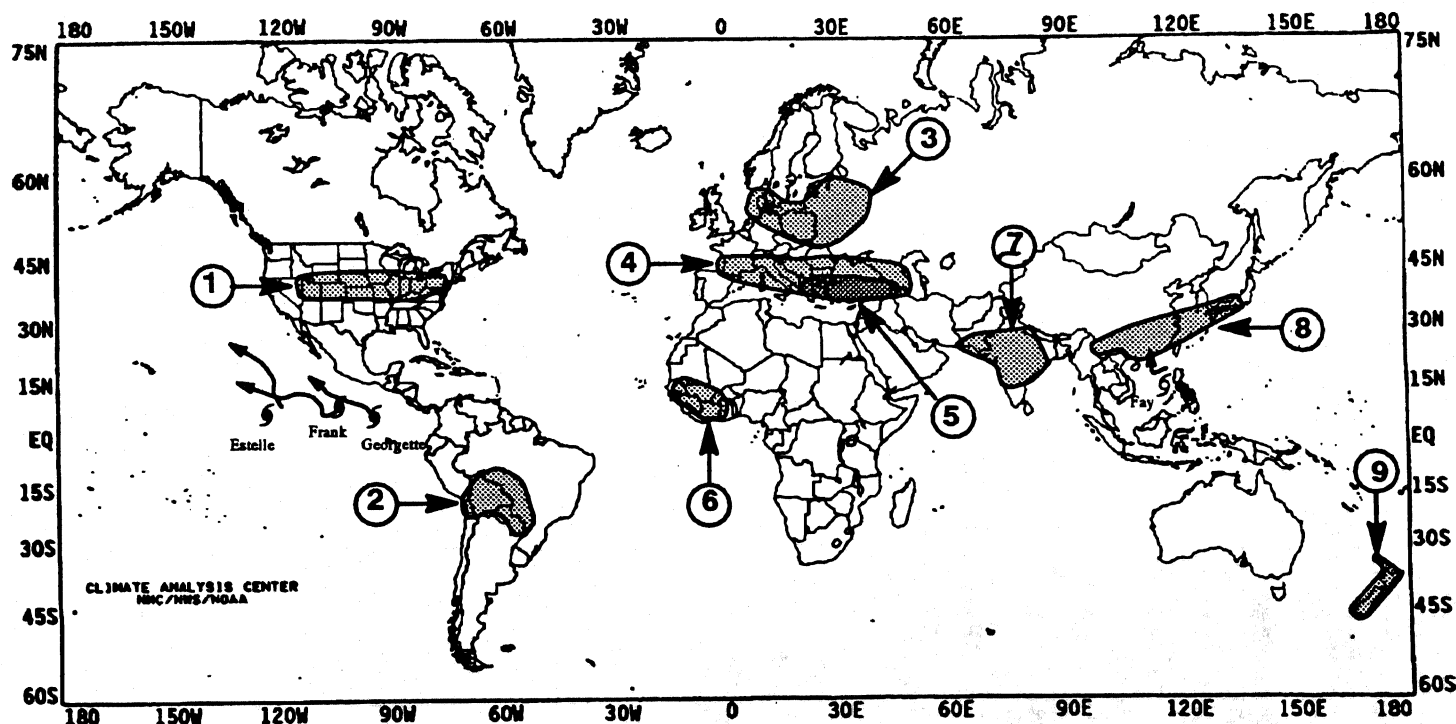
#### MORE HEAVY RAINS IN SOME AREAS.

Heavy showers soaked Japan and South Korea with 100 to 300 mm of rain as six-week surpluses approached 200 to 400 mm. Farther south, Tropical Storm Fay dumped 100 to 400 mm of rain on Hong Kong and 30 to 80 mm on adjacent provinces of southeastern China, but most other areas received only light to moderate rains, engendering relief from the recent downpours and flooding [5 weeks].

### 9. New Zealand:

#### SHORT-TERM DRYNESS ENDS.

Precipitation totals on the North Island ranged from 20 to 60 mm, but generally less than 15 mm fell on the South Island. Several weeks of moderate rains have eased short-term moisture shortages, but long-term deficits and hydroelectric power concerns remain [Ended at 7 weeks].



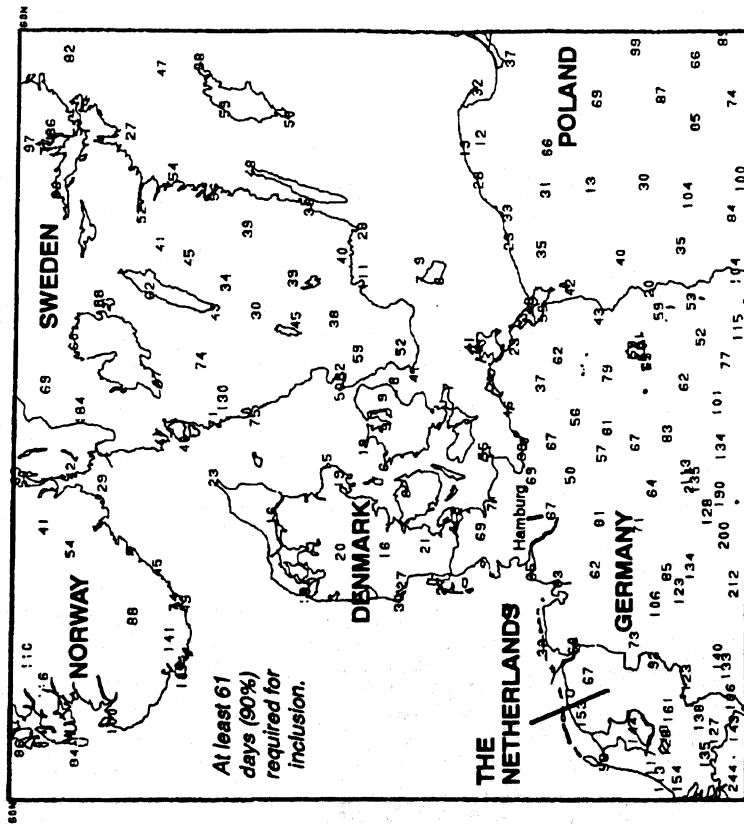
#### EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.

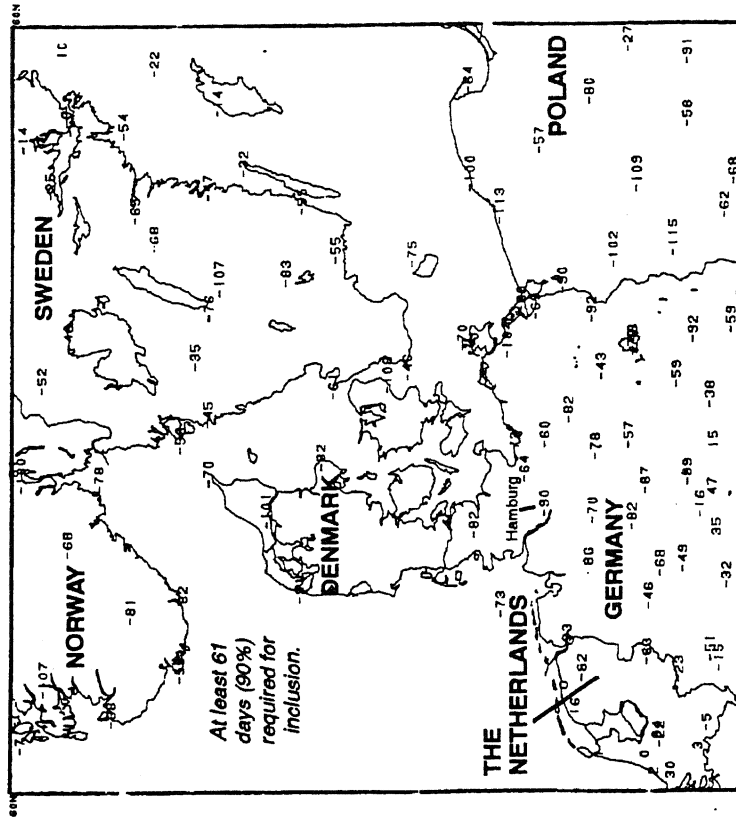
MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

# GLOBAL CLIMATE HIGHLIGHTS FEATURE

**TOTAL PRECIPITATION (mm)**  
MAY 12 – JULY 18, 1992



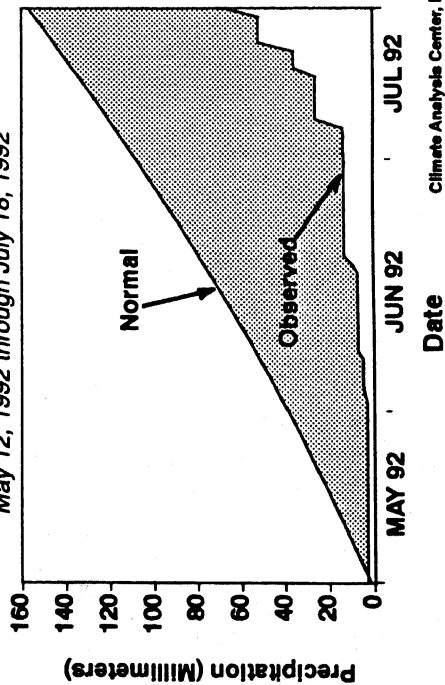
**DEPARTURE FROM NORMAL PRECIPITATION (mm)**  
MAY 12 – JULY 18, 1992



## DAILY CUMULATIVE PRECIPITATION

Hamburg, Germany

May 12, 1992 through July 18, 1992



Climate Analysis Center, NOAA

**DRY WEATHER CONTINUES TO DOMINATE NORTH-CENTRAL EUROPE.** Although light rainshowers have dampened parts of northern Germany, Denmark, southern Scandinavia, and western Poland during the last few weeks, large moisture shortages remain throughout the region. Accumulated deficits of 50 – 100 mm during May 12 – July 18, 1992 were common, with the lowest rainfall totals observed across Denmark. Many locations in central and eastern Denmark, including Copenhagen, received less than 10 mm during the period. According to press reports, the dryness has engendered numerous wildfires and may have damaged crops, particularly in Poland, where government officials described the current dry spell as the worst drought of the last few decades.

# UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

## FOR THE WEEK OF JULY 12 - 18, 1992

Heavy rains and severe thunderstorms continued to barrage the central and southern Great Plains, the Corn Belt, the Northeast, and portions of the Southeast, causing damage but providing more relief from the long-term dryness plaguing some areas. Thunderstorms swept from the central Plains to the northern Appalachians and mid-Atlantic coast, spawning high winds, tornadoes, hail, and heavy rain. In Ohio, six to ten inches of rain flooded highways and cut off electricity for about 20,000 residents in the Columbus area while tornadoes, high winds, and torrential downpours destroyed at least a dozen homes and five businesses in the western portions of the state and along Lake Erie, according to press reports (see below). In addition, more than seven inches of rain fell in parts of southeastern Nebraska, forcing many rivers to overflow their banks and flooding numerous streets and highways. In western New York, a severe storm uprooted trees, smashed cars and damaged buildings in Fredonia. On Tuesday, tornadoes damaged many homes in Kendallville, IN and destroyed houses and mobile homes along a five-mile path through southwestern Michigan. At mid-week, fierce storms packing lightning, hail, and heavy rain continued to pound the Northeast and Midwest. Storms knocked out power for tens of thousands of customers in New Jersey, Long Island, NY, and eastern Iowa while two inch diameter hail pelted crops in Taylor County, southeast Iowa. Showers continued to inundate Indiana on Saturday, where persistent rain left many rivers at flood stage. As the week ended, wildfires engendered by hot dry weather burned 1,550 acres of brush in the Cleveland National Forest, 30 miles east of San Diego, CA, and 6,300 acres north of Boise, ID, according to press reports.

The week commenced with violent thunderstorms widespread from the higher elevations of northern and central California to the Northeast and mid-Atlantic and across the Southeast. Thunderstorms spawned tornadoes in Wyoming, Florida, and the Midwest while heavy rain caused mud and rock slides in east central California, near Salt Lake City, UT, and in Tucker County, WV. About 7,500 Chicago, IL area customers lost power because of storms on Monday. The East remained smothered by a heat wave, with highs in the upper 90's and 100's from Texas to the mid-Atlantic coast. Scattered showers and thunderstorms continued into mid-week from the central and southern Plains to the Northeast, with brief but

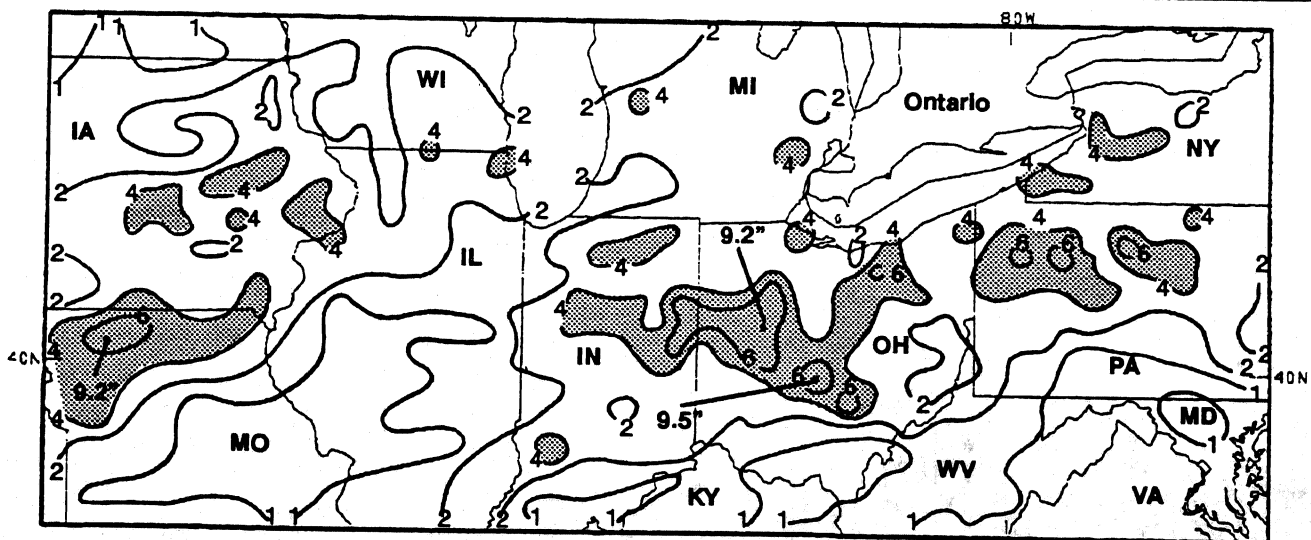
intense rain pounding the Plains and middle Mississippi and Ohio Valleys.

During the latter part of the week, showers and thunderstorms developed ahead of and along a cold front as it moved southeastward from the upper Mississippi Valley and central Plains to the Atlantic coast. Heavy rain was widespread across the southern Plains, lower Mississippi Valley, Southeast, Ohio Valley, and Northeast. Hot and humid air ahead of the front was replaced by much cooler air as the front drifted eastward. A second cold front brought more cool weather into the northern Rockies and northern Plains at week's end.

According to the River Forecast Centers, the greatest weekly totals (from two to nine inches) were recorded in the central and southern Plains, lower Mississippi Valley, Corn Belt, and Northeast. More scattered totals of two or more inches were reported across the Southeast, the central Appalachians, the Great Lakes, the upper Mississippi Valley, the northern Plains, the central Rockies, the Sierra Nevadas of California, the Alaskan panhandle, and eastern Hawaii. Light to moderate amounts were observed in the remainders of the central Rockies, the Great Plains, the Mississippi and Ohio Valleys, the Great Lakes, the Northeast, the mid-Atlantic, the Southeast, the higher elevations of the Far West, Alaska, and Hawaii. Little or no precipitation fell in the northern and southern Rockies, Southwest, and the remainders of the Far West.

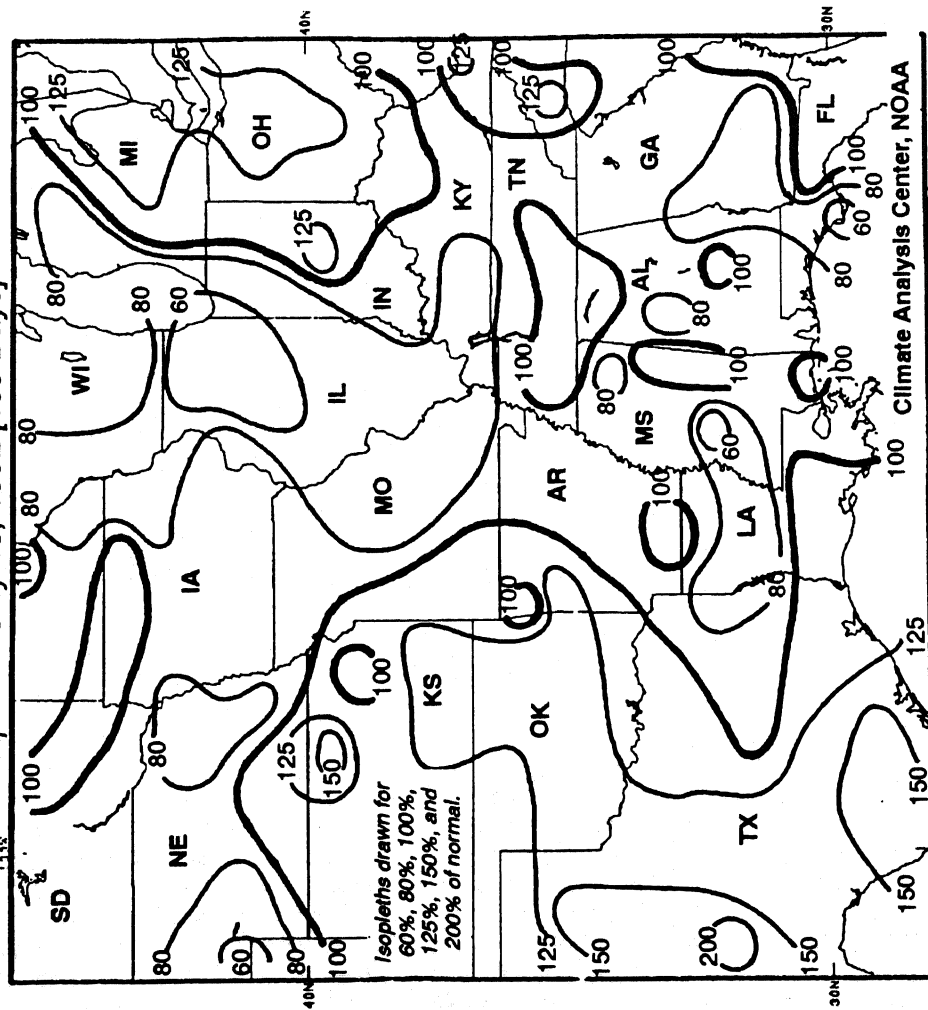
Warmer than normal conditions in the contiguous United States prevailed along the Pacific, middle and southern Atlantic, the western and eastern Gulf coasts, and the Tennessee and southern Ohio Valleys. Weekly departures between +3°F and +6°F were observed along the immediate Pacific coast and across the mid-Atlantic states and Carolinas. In Alaska, above normal temperatures covered much of the state, with weekly departures of up to +3°F in the interior.

In contrast, unseasonably cool weather dominated the Great Basin, Rockies, Great Plains, Mississippi Valley, Great Lakes, and Northeast. Departures of -6°F to -9°F were common from the northern and central Rockies to the upper Mississippi Valley. In Alaska, cooler than normal conditions were limited to scattered parts of the west-central, southwestern, and southeastern portions of the state.



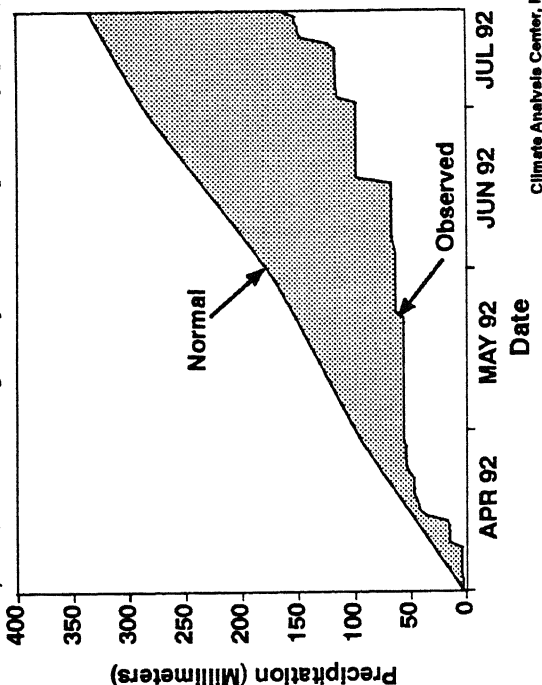
**TOTAL PRECIPITATION DURING JULY 12 - 18, 1992.** Isopleths drawn for 1, 2, 4, and 6 inches. Shaded areas received more than 4 inches. A broad, poorly-defined, slow-moving cold front became the focus for several outbreaks of torrential downpours and severe weather last week. Large sections of the Midwest, Ohio Valley, and central Appalachians received over 4 inches of rain, with the highest totals recorded in central and western Ohio. Although the thunderstorms generated damaging winds, flash flooding, and several tornadoes, the rainfall provided relief from short-term dryness in the Corn Belt, and helped alleviate long-term precipitation shortages in parts of Ohio (see next page). Columbus, Ohio almost entirely alleviated a precipitation deficit dating back to the start of the 1991 growing season (mid-Spring).

# PERCENT OF NORMAL PRECIPITATION April 1 - July 18, 1992 [109 Days]

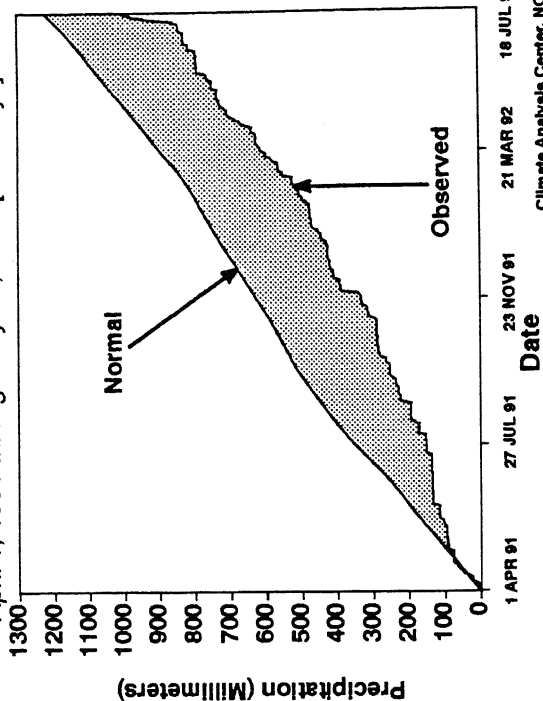


**STILL TOO DRY IN CENTRAL CORN BELT DESPITE LAST WEEK'S HEAVY RAINS.** The torrential downpours of the past few weeks have generally evaded the northern half of Illinois, where growing season precipitation totals remain under 60% of normal. In other sections of the Midwest, Mississippi Valley, and Southeast, a variety of moisture conditions were observed, with no other region experiencing widespread deficient rainfall since April 1. Abundant rains during the past couple of months eliminated most of the rainfall deficits that had accumulated early in the growing season across the Southeast. In the Ohio Valley, most locations had been experiencing severe to extreme drought conditions (according to the Palmer Drought Severity Index) because of deficits that began accumulating at the beginning of the 1991 growing season. Last week's rains, however, alleviated most of the shortfalls that accumulated during the previous 15 months in central and southwestern Ohio, but residual deficits remained in parts of eastern Ohio,

## DAILY CUMULATIVE PRECIPITATION Chicago (O'Hare Airport), Illinois April 1, 1992 through July 18, 1992 [109 Days]

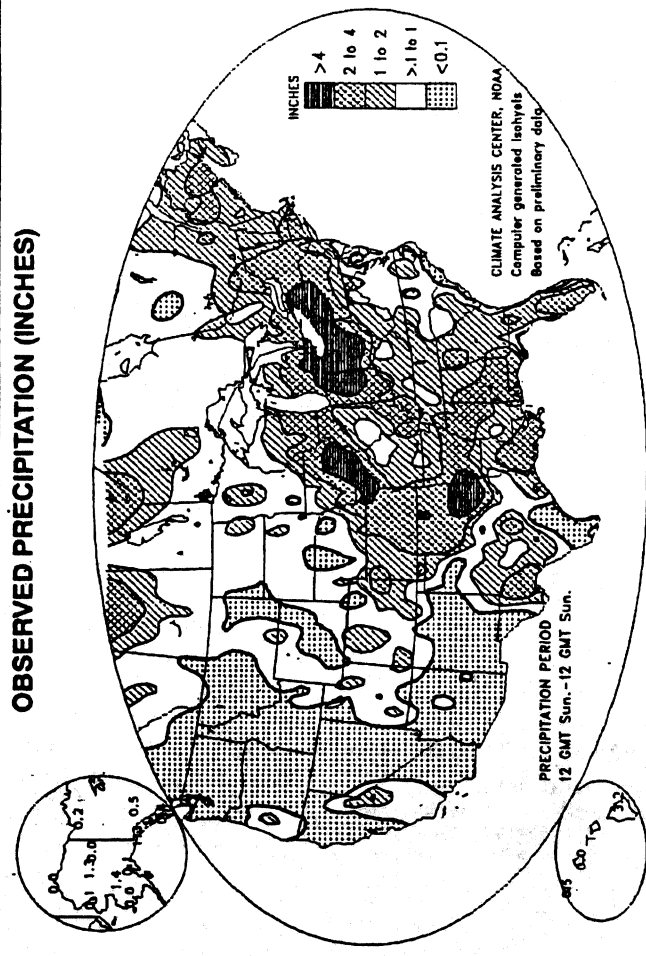


## DAILY CUMULATIVE PRECIPITATION Akron, Ohio April 1, 1991 through July 18, 1992 [475 Days]

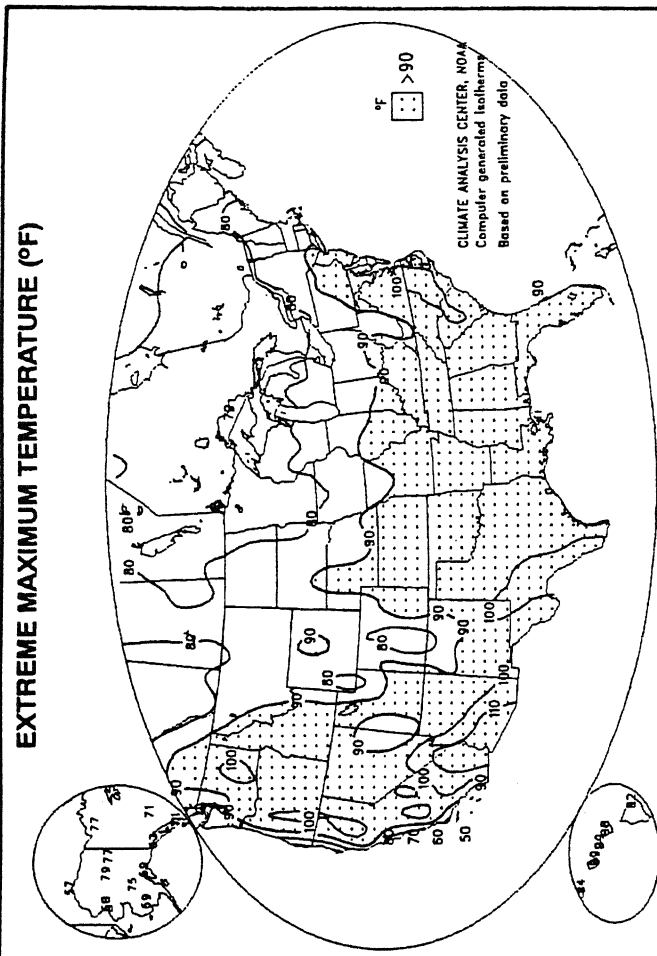


# UNITED STATES WEEKLY CLIMATE CONDITIONS (July 12 – 18, 1992)

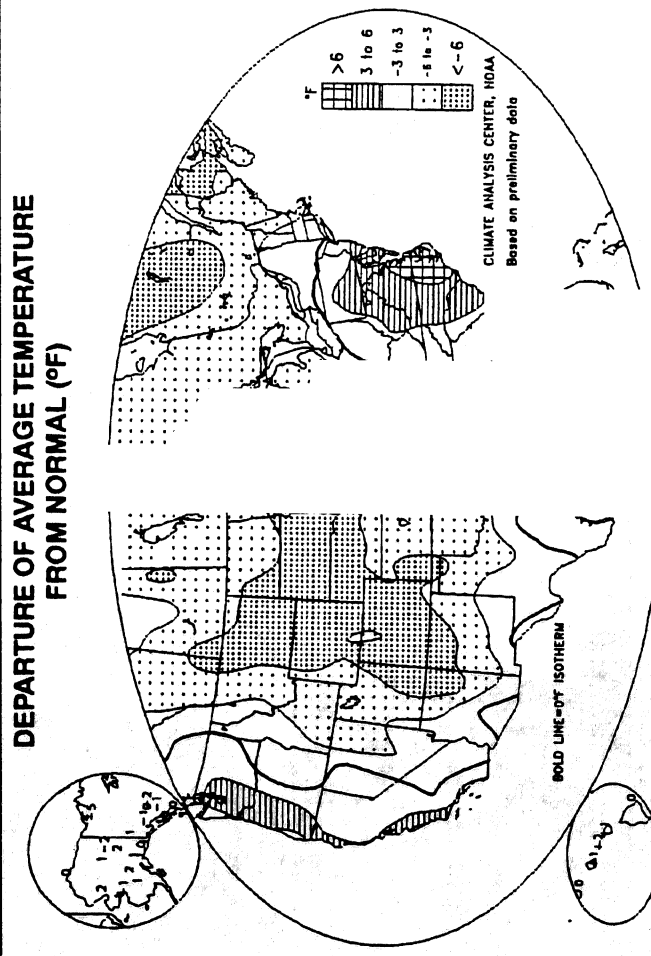
OBSERVED PRECIPITATION (INCHES)



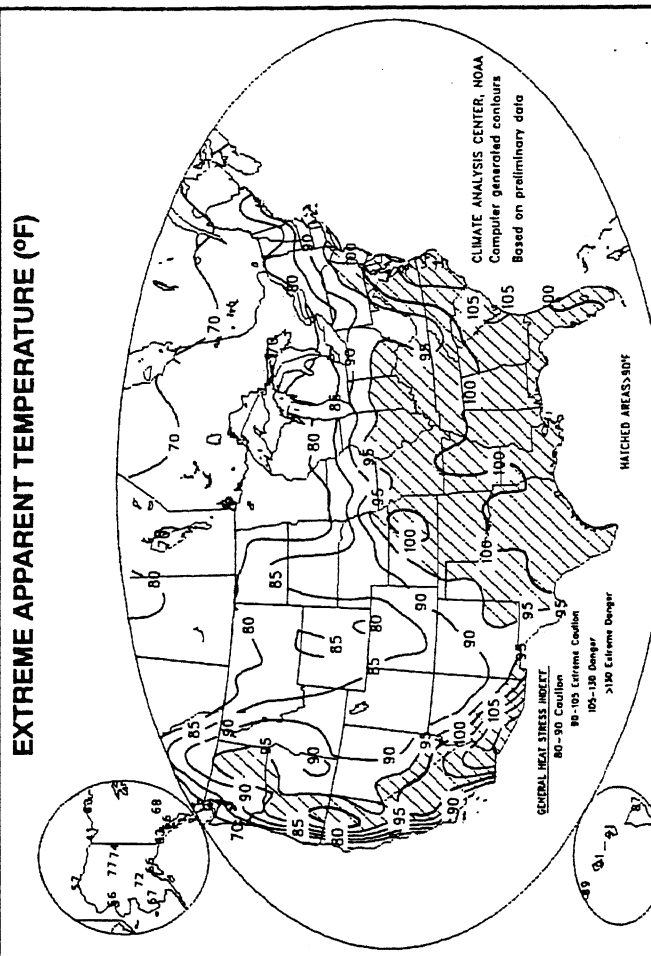
EXTREME MAXIMUM TEMPERATURE (°F)



DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

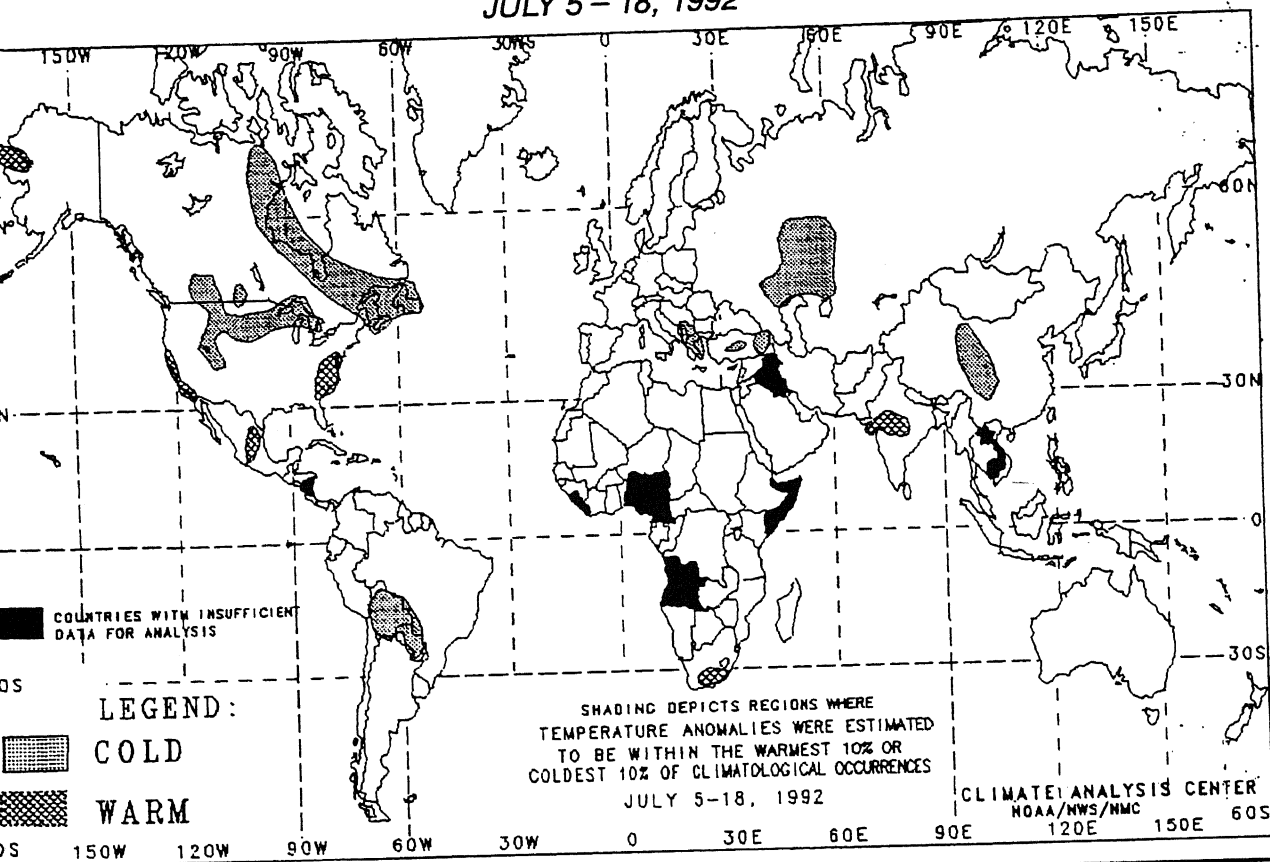


EXTREME APPARENT TEMPERATURE (°F)



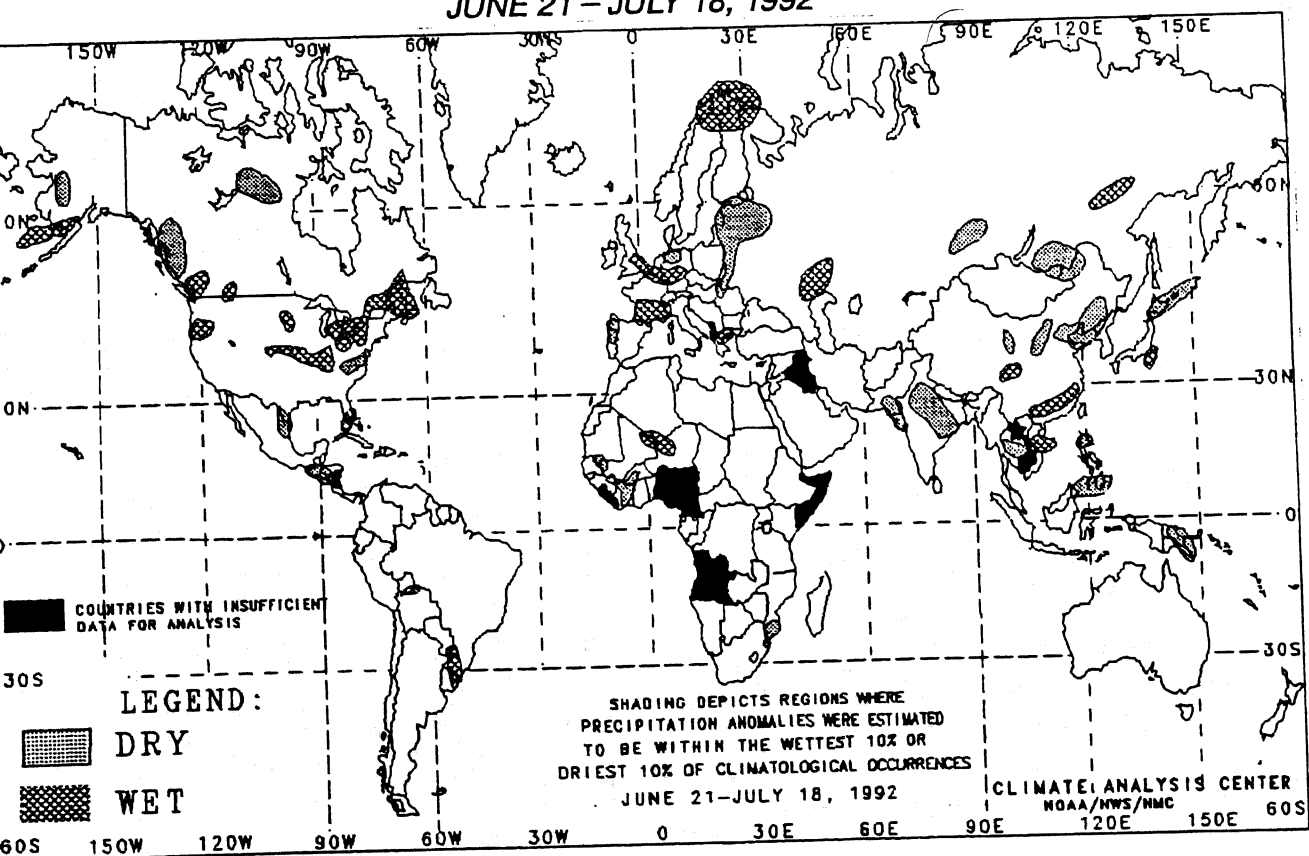
## 2-WEEK GLOBAL TEMPERATURE ANOMALIES

JULY 5 - 18, 1992



## 4-WEEK GLOBAL PRECIPITATION ANOMALIES

JUNE 21 - JULY 18, 1992



# SPECIAL CLIMATE SUMMARY

## ANALYSIS AND INFORMATION BRANCH

### CLIMATE ANALYSIS CENTER, NMC

### NATIONAL WEATHER SERVICE, NOAA

## UPDATE ON THE 1992 INDIAN MONSOON

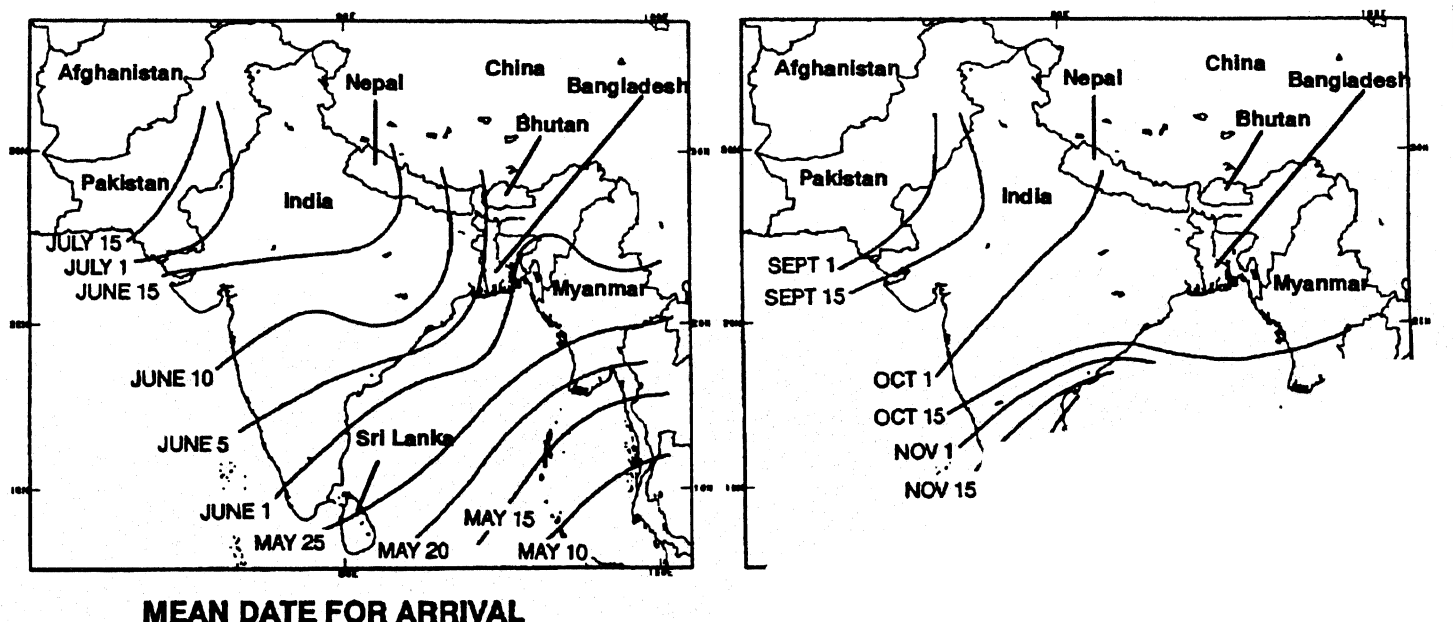
The Indian (or southwest Asian) monsoon typically provides the bulk of the subcontinent's annual precipitation during June – September, although significant rains may fall during the late spring and early fall months (April, May, and October). The northernmost extent of monsoonal rains typically progresses rapidly from the Bay of Bengal and southern Bangladesh northwestward to central and west-central India during the first half of June. Through the ensuing month, the rains move a little more slowly northwestward, reaching central Pakistan around mid-July. By the start of September, however, the monsoon has normally withdrawn southeastward out of Pakistan, and continues southeastward to the southern half of the peninsula by the end of October (Figure 1).

During the 5-month period of May through September, more than three-quarters of the annual average rainfall is typically measured across most of India and Bangladesh, except along the eastern coastline, central and southern sections of peninsular India east of the Western Ghats, and Kashmir. More than 90% of the annual precipitation normally falls during this period through central and west-central India and along the western coastline. The heaviest monsoonal rains normally fall on extreme eastern India, southern Bangladesh, and the western Indian coastline (over 2000 mm during the 5-month period). In sharp contrast, the relatively short-lived monsoon in extreme western India deposits fewer than 500 mm during the same period.

Prior to the normal advance of monsoonal rains, severely dry conditions developed through Sri Lanka, which lasted from the beginning of 1992 through mid-April. In addition, those sections of India that typically receive light rainfall during March and April were also unusually dry. Deficits of up to 350 mm accumulated in parts of Sri Lanka before significant rains finally arrived in mid-April.

During May, near to above normal rainfall was measured through Sri Lanka and southern India, fueling recovery from the previously dry conditions. Abnormally heavy rains also fell along the eastern coastline, in Bangladesh, and (to a lesser extent) across extreme eastern India. The proximity of Cyclone 1B, which made landfall on west-central Myanmar around mid-month, brought up to 250 mm of rain within one week to Calcutta and adjacent areas. Some flooding was reported in Sri Lanka as the month closed and June began.

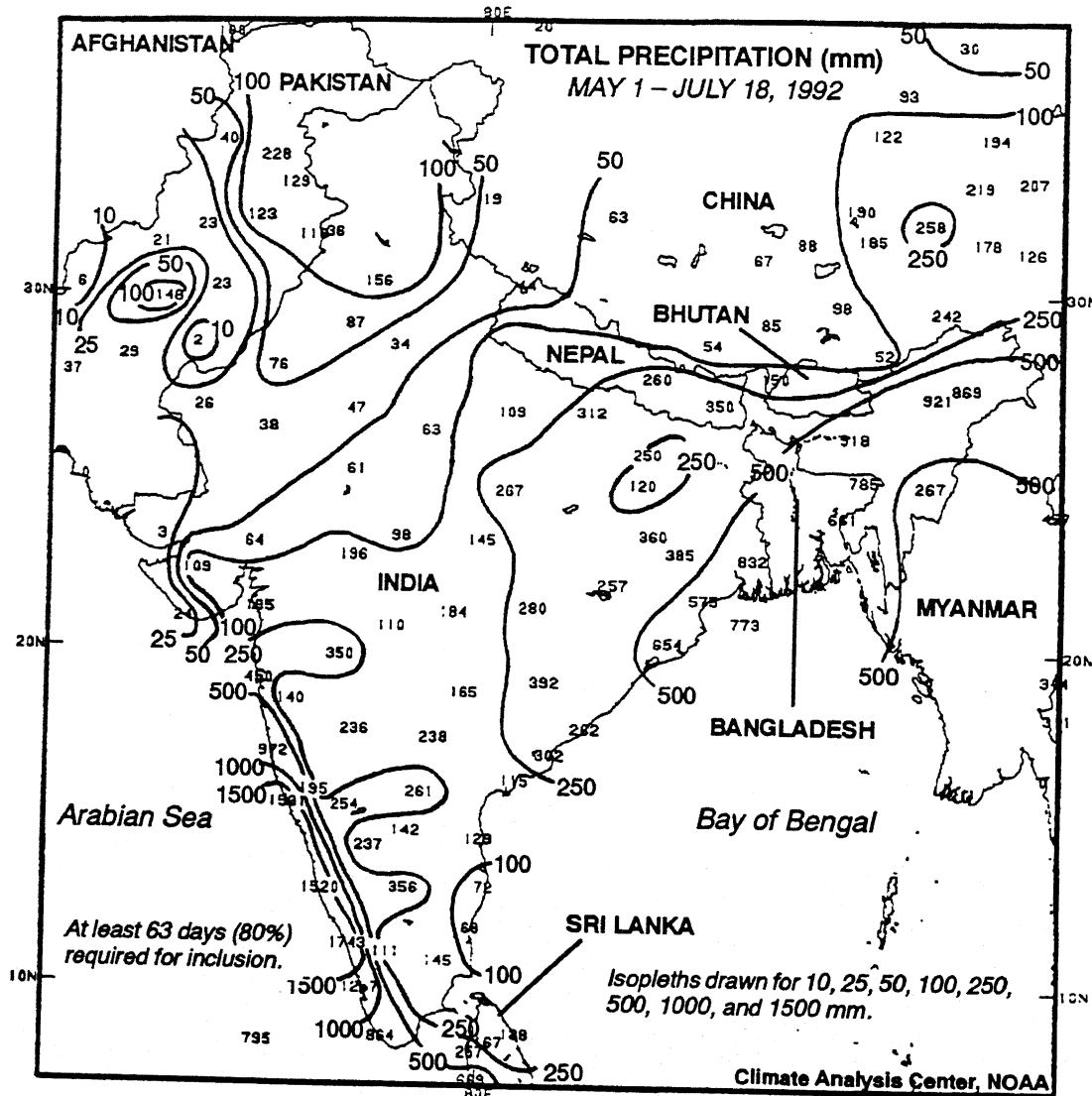
### MEAN DATES OF THE SOUTHWEST MONSOON'S ARRIVAL AND RETREAT



**FIGURE 1.** The mean advance and retreat of the southwest / to southeastern Bangladesh, southern Assam, and extreme southeast northwestward across the subcontinent, covering most locations of Pakistan. Mid-July through September marks the peak of the nor more slowly than they had advanced.

Despite the early start to the monsoon in southern and eastern portions of the subcontinent, much of central and southeastern India experienced an abnormally dry June, with many locations observing precipitation totals among the lowest 10% of the 1951–1980 climatological distribution. While weekly rainfall totals reached 400 mm in southwestern India and exceeded 250 mm from Calcutta eastward, most of southeastern, central, and northwestern India recorded only scattered 10–40 mm amounts weekly. The rains in northeastern India were enhanced by Cyclone 3B, which swept into India near Calcutta around mid-month, generating flooding throughout the coastline of Bangladesh. Farther north, rainfall was also abundant as near to above normal totals dampened northern Pakistan, Kashmir, and Nepal.

The pattern of June 1992 continued into the first two weeks of July, but ample rains finally spread throughout the subcontinent last week. Still, seasonal rainfall totals of only 25–100 mm had fallen across central and western India as of July 18 (Figure 2), which represents less than 50% of normal in many areas (front cover). The dryness in central and northwestern India may have damaged numerous crops, according to press reports, so continued ample precipitation is needed to minimize the impact of the current moisture shortages.



**FIGURE 2.** Total Precipitation across the Indian subcontinent during May 1–July 18, 1992. As usual, a wide array of precipitation totals were recorded during the first 2.5 months of the Indian monsoon. Amounts reached as high as 1743 mm along the southwestern coast while portions of central Pakistan and the western Indian deserts received under 10 mm. The 25–100 mm measured in central and northwestern India is under 50% of the normal seasonal total through July 18 at most locations, with accumulated deficits reaching 700 mm in some areas.

# SPECIAL CLIMATE SUMMARY

## ANALYSIS AND INFORMATION BRANCH

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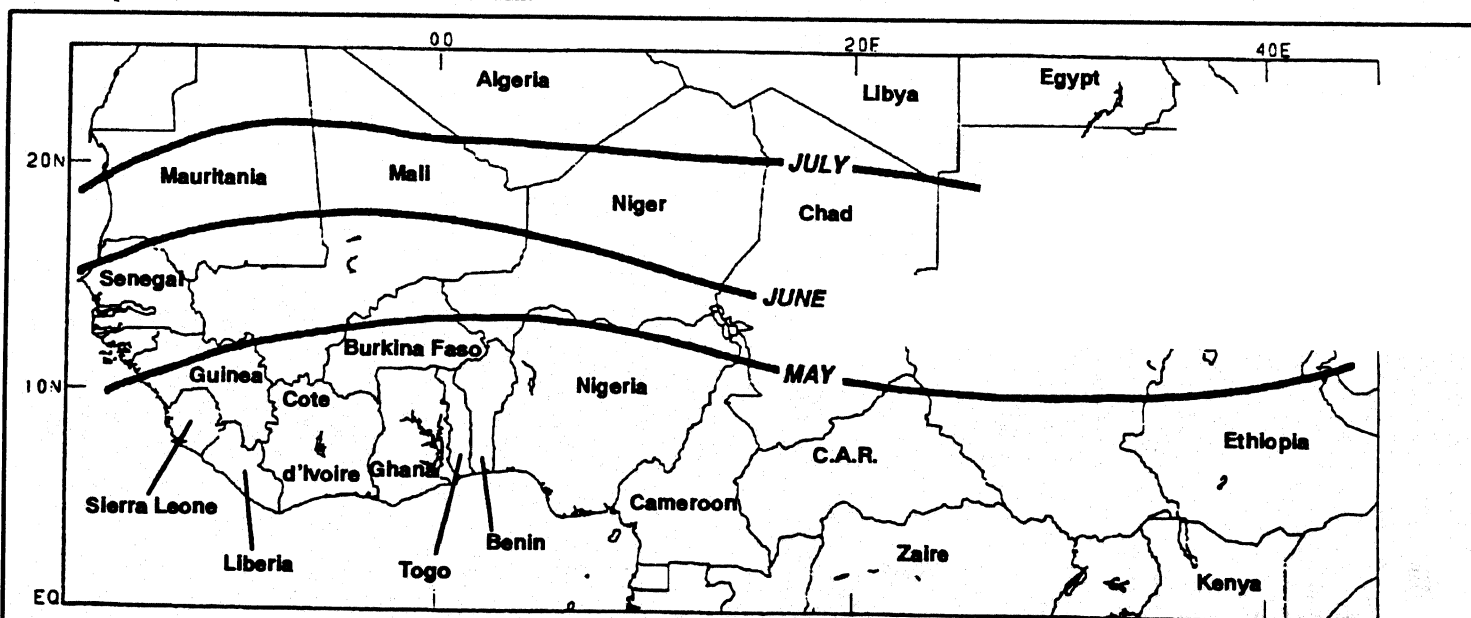
## UPDATE ON THE 1992 AFRICAN SAHEL RAINY SEASON

Rain falls in a distinct pattern across the swath of Africa that lies north of the Equator and south of the Sahara Desert. Locations close to the equator receive rainfall throughout the year, with a weak Winter maximum evident in some areas. North of approximately 5°N latitude, however, a pronounced maximum occurs during the summer months (May – September), which becomes more pronounced near the Sahara. North of 10°N, most locations receive over 85% of the normal annual rainfall during the summer months. In addition, the rainy season shortens and the total annual precipitation decreases as one moves northward through the Sahel to the desert, where little or no rain is measured. The heaviest May – September totals in sub-Saharan Africa usually fall across western sections of Guinea-Bissau, Guinea, and Cote d'Ivoire as well as throughout Sierra Leone and Liberia, where 1600–3710 mm are typically recorded. In contrast, fewer than 400 mm normally dampen the northern tier of the Sahel from northern Senegal eastward through northern Ethiopia. Sahelian rainfall is primarily carried northward by the Inter-Tropical Convergence Zone (ITCZ), which typically stretches across the Sahel near 10°N around the end of May. During June and July, the ITCZ and associated seasonal rains typically drift northward to near 20°N for a short time (Figure 1).

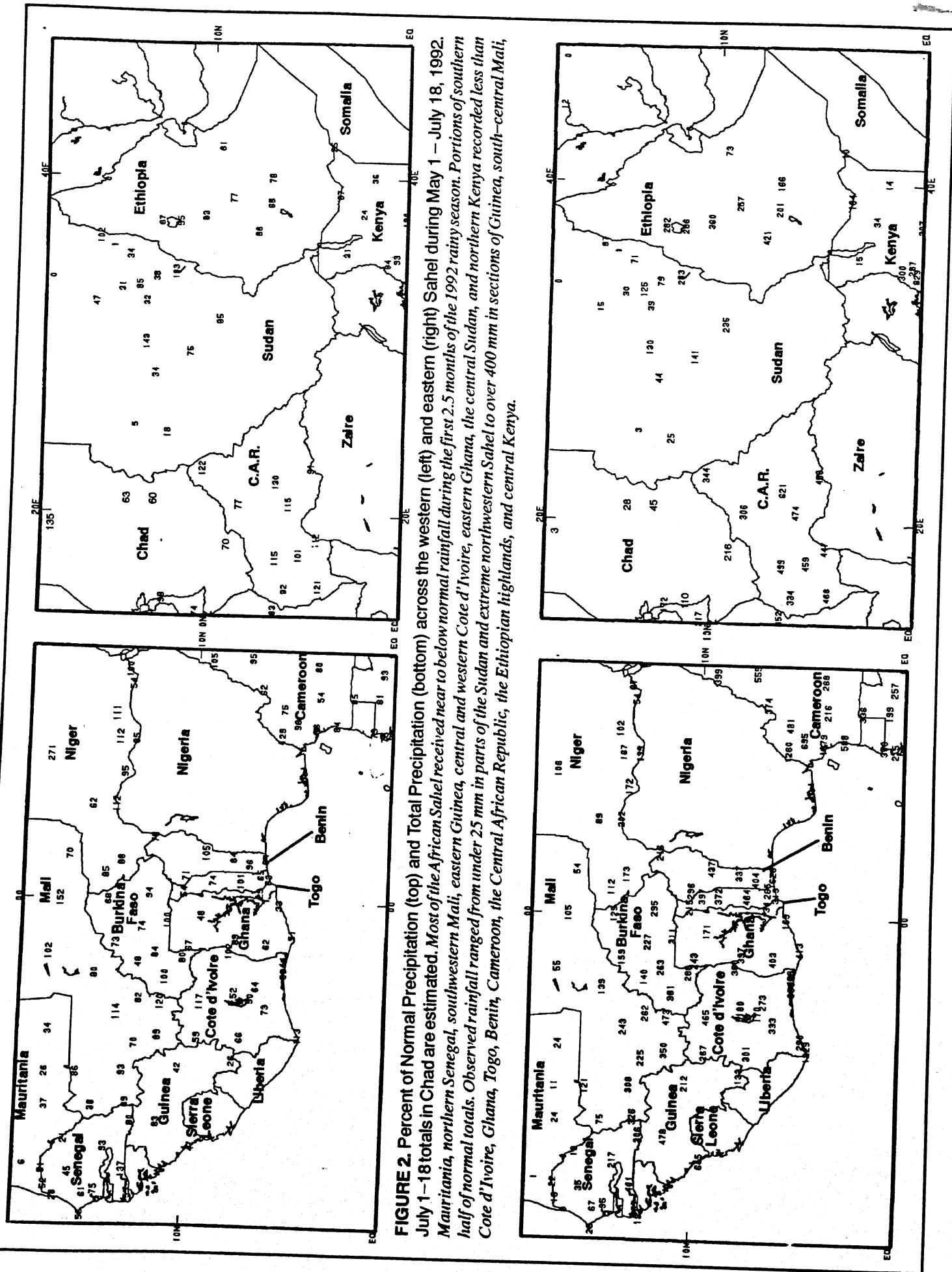
As April 1992 drew to a close, most areas that normally receive rainfall during the late winter and early spring recorded subnormal totals, including most of Cote d'Ivoire, Ghana, Togo, Benin, and southern Chad. February – April precipitation totals were among the lowest 10% of the 1951–1980 climatological distribution in Togo, Ghana, and eastern Cote d'Ivoire. In contrast, western Cote d'Ivoire, eastern Guinea, and the Ethiopian highlands recorded near normal totals during the period.

Precipitation during May 1992 was uneventful, with most locations receiving near normal amounts. Parts of western Mali, eastern Guinea, central Burkina Faso, Ghana, eastern Cote d'Ivoire, and the east-central Sudan measured somewhat lower than normal totals while pockets of southern Niger, south-central Mali, and Benin received ample rainfall.

Widespread drier than normal conditions began to grip much of the Sahel during June. Monthly rainfall amounts were among the lowest 10% of the climatological distribution in Senegal, eastern Guinea, much of Cote d'Ivoire, northern Benin, and Togo. Locations farther east fared somewhat better, although pockets of dryness developed across the central Sudan and central Ethiopia. By the end of the month, little or no seasonal rain had fallen across the northern half of the Senegal, southern Mauritania, and adjacent Mali. Farther east, scattered showers advanced as far north as central Niger and the northeastern Sudan during June. Conditions improved somewhat during the first 18 days of July, with light to moderate rains reaching northern Senegal, southern Mauritania, central Mali, central Niger, and northeastern Sudan last week; however, timely and ample rains must continue if the current shortfalls are to be alleviated by the end of the rainy season (Figure 2). As of July 18, 1992, less than half of normal seasonal totals had fallen on northern Senegal, southern Mauritania, eastern Guinea, parts of southeastern Cote d'Ivoire and southern and eastern Ghana, pockets of central and northeastern Sudan, and northern Kenya. Above normal amounts were restricted to south-central Mali, northern Cote d'Ivoire, central Mali and south-central and central Niger, much of the Central African Republic, and isolated locations in the Sudan.



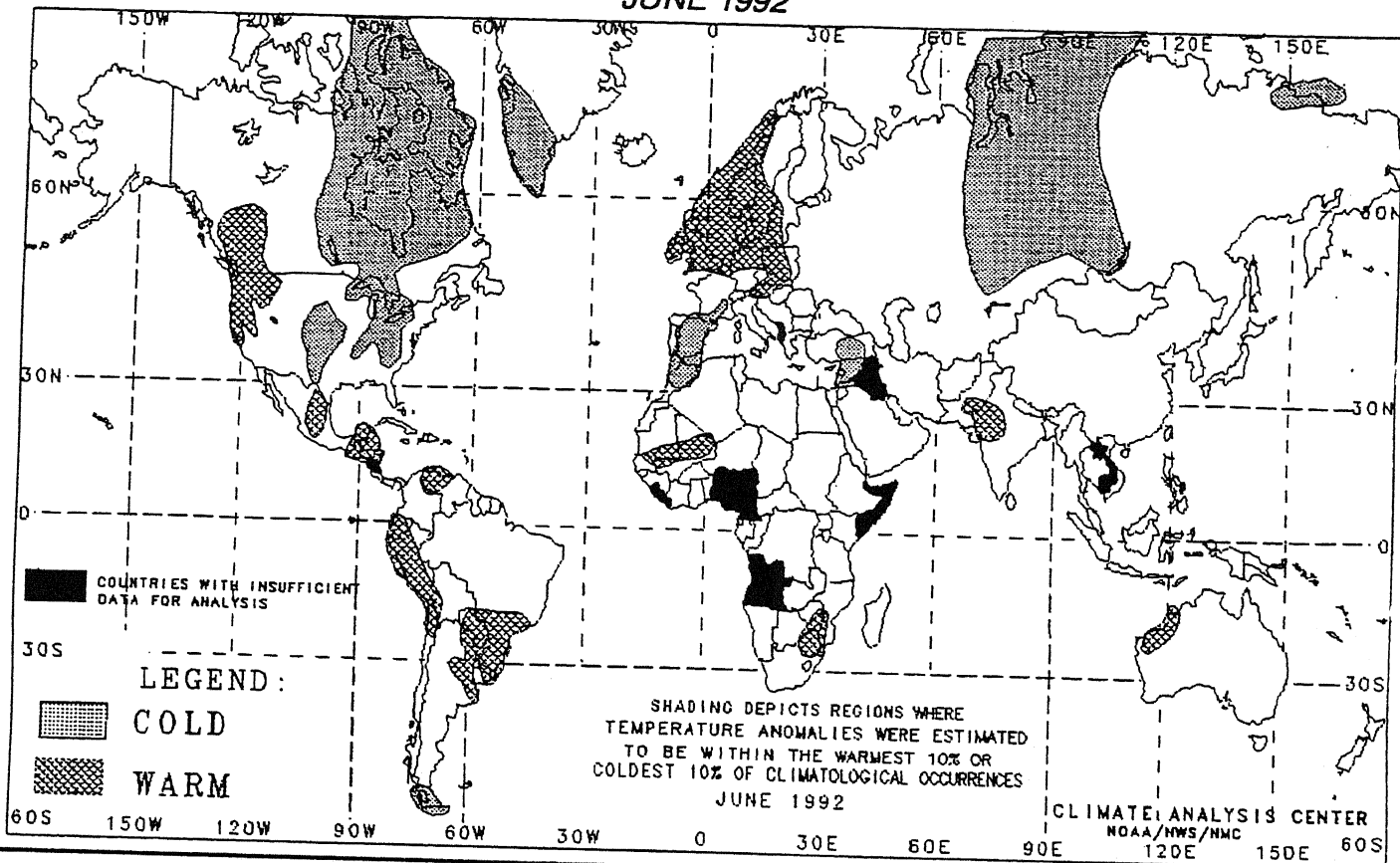
**FIGURE 1.** The normal northernmost extent of seasonal rains during May, June, and July. As the rainy season progresses, showery rainfall is carried northward by the Inter-Tropical Convergence Zone (ITCZ). North of 10°N, the May – September period typically brings 85%–99% of the normal annual precipitation to most locations. The bulk of these rains are generated by disorganized convection associated with the ITCZ or by organized tropical waves that form along the ITCZ. Farther south, rainfall is more evenly distributed through the year.



**FIGURE 2.** Percent of Normal Precipitation (top) and Total Precipitation (bottom) across the western (left) and eastern (right) Sahel during May 1 – July 18, 1992. July 1–18 totals in Chad are estimated. Most of the African Sahel received near to below normal rainfall during the first 2.5 months of the 1992 rainy season. Portions of southern Mauritania, northern Senegal, southwestern Mali, eastern Guinea, central and western Cote d'Ivoire, eastern Ghana, the central Sudan, and northern Kenya recorded less than half of normal totals. Observed rainfall ranged from under 25 mm in parts of the Sudan and extreme northwestern Sahel to over 400 mm in sections of Guinea, south-central Mali, Cote d'Ivoire, Ghana, Togo, Benin, Cameroon, the Central African Republic, the Ethiopian highlands, and central Kenya.

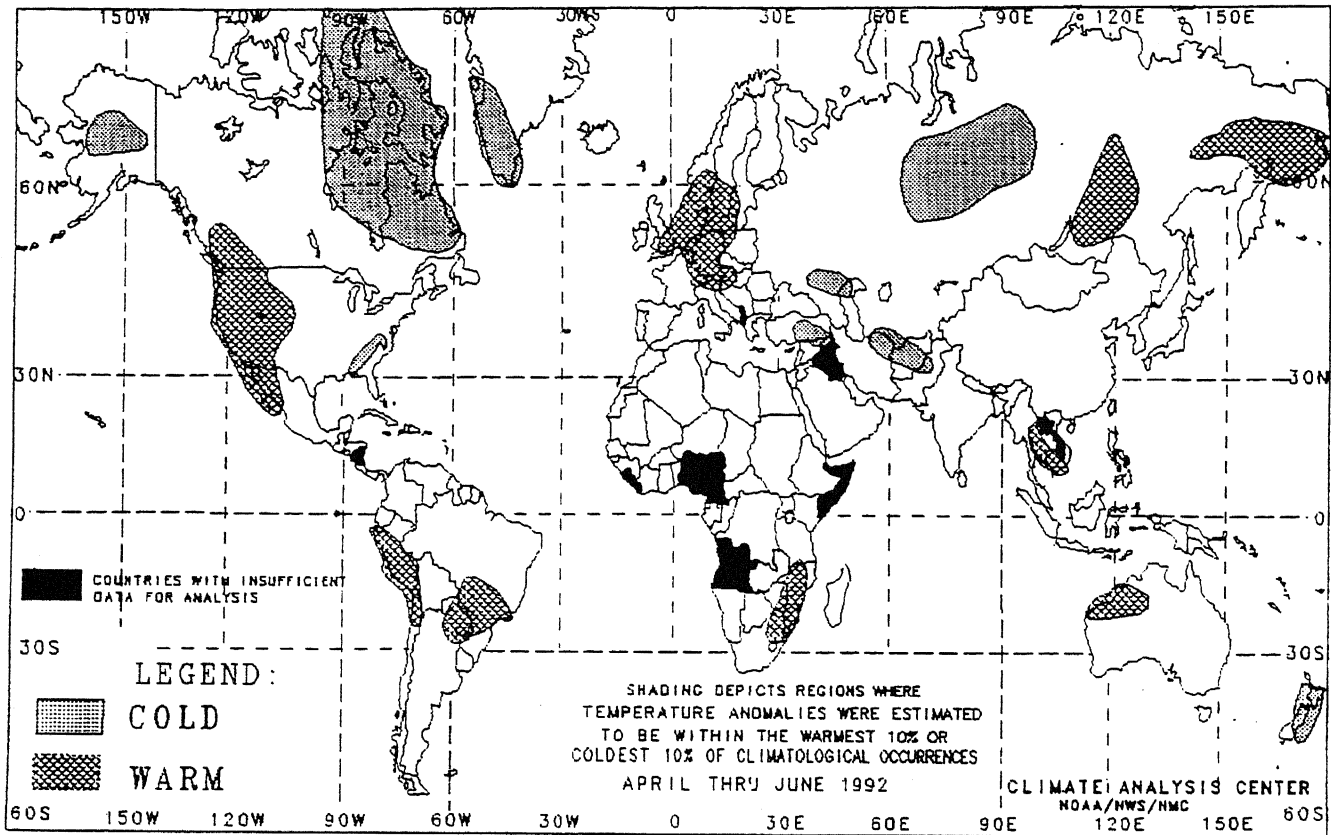
# MONTHLY GLOBAL TEMPERATURE ANOMALIES

JUNE 1992



### 3-MONTH GLOBAL TEMPERATURE ANOMALIES

APRIL - JUNE, 1992



### 3-MONTH GLOBAL PRECIPITATION ANOMALIES

APRIL - JUNE, 1992

